WORLD ECONOMIC FORUM

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White Paper

Human-Centric Health: Behaviour Change and the Prevention of Non-Communicable Diseases

In collaboration with Willis Towers Watson

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Contents

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Executive Summary

The burden of non-communicable diseases (NCDs) – heart disease, mental illness, cancer, respiratory disorders and diabetes – is heaviest in high-income countries. However, it is growing at the fastest rate in low-income and middle-income countries, worsened by population ageing, urbanization and globalization of risk factors.

Traditional approaches to dealing with NCDs have focused on medical care delivery to people with established disease. Stakeholders* with an interest in reducing the impact of NCDs have tended to work independently, connected only intermittently with other stakeholders when goals aligned. This strategy has not yielded the maximum benefit potentially available from the broad, deep array of organizations and institutions with resources to invest in reducing the global impact of NCDs.

Decreasing the effect of NCDs requires a more systematic response. This report describes how a human-centric health ecosystem (HCHE) can bring together stakeholders from the public and private sectors and create a context for cooperation to achieve shared goals: reducing the risks that bring about and worsen NCDs; providing efficient and effective care for disease sufferers; and thereby improving well-being across the globe.

An HCHE is a complex environment in which an array of organizations interacts to yield health-related outcomes for individuals and populations. Fundamental to the HCHE concept is its focus on the individual and his or her perceptions, intentions and behaviour as those influence personal health results. Personal health, in turn, ultimately drives population health. In a fully developed HCHE:

- Stakeholders and individuals pursue goals, separately and in concert, responding to motivations and behavioural triggers and mutually influencing each other.
- Their actions affect NCD risk factors and influence how those risks are dealt with by individuals.
- The environment of the HCHE provides a context rich in behavioural triggers that can encourage healthy decisions.
- These personal decisions, made in the context of the HCHE, affect the incidence and prevalence of NCDs.

Placing the individual at the centre of the HCHE makes it a demand-driven structure. An HCHE works best when stakeholders recognize and respond to the behavioural precepts that influence individual decisions. Prominent among the behaviours that affect people's health choices are:

- **Present bias** – Choosing what seems most valuable today and heavily discounting future benefits
- **Loss aversion** – Placing far greater psychological weight on detrimental outcomes than on beneficial ones
- **Framing** – Basing the interpretation of positive or negative possibilities on the way information is presented
- **Availability/narrative** – Responding to the most compelling stories more strongly than to logic and statistics
- **Social norms** – Being influenced by what others in family or peer groups are doing or choosing
- **Choice architecture and defaults** – Making decisions based on how, and how many, options are presented and on which options are easiest to select
- **Depletion** – Making decisions influenced by feelings of low energy or attention
- **Optimism** – Believing unrealistically in the personal ability to effect change and avoid adverse outcomes.

Informed consumer demand, activated by these behavioural triggers, provides a context in which:

- Product producers and retailers can pinpoint and take advantage of market opportunities that improve population health.
- Political leaders can take guidance on how to gain public support and approval for action.
- NGOs and community organizations can identify the causes most likely to address urgent needs and benefit large populations.
- Public voice can ensure that NCDs receive appropriate attention in the competition for scarce social resources.

Individuals experience the effects of stakeholder interactions at various points on a continuum of care. Cost estimates from the World Health Organization (WHO) suggest that investment of as little as $1– $3 per person per year could substantially reduce both morbidity and mortality attributed to NCDs. Multiple cost-effective interventions (for instance, vaccination and better individual behaviour for prevention; tools and technology for early detection; strategies for modification of NCD risk factors; and inexpensive drugs for prevention and treatment) have demonstrated their effectiveness in a variety of settings. Implementation of these measures, especially in low-resource settings, could slow the rising burden of NCDs, reduce medical expenses, increase productivity and improve the quality of life[1].

We believe our elaboration of the HCHE model provides useful additional detail on the architecture of a health system that can achieve these goals.

*Individuals are clearly stakeholders in the HCHE. For our purposes, however, we use the term "stakeholders" to refer to businesses, government departments, non-governmental agencies, organizational participants and other groups (e.g., families) in the HCHE.

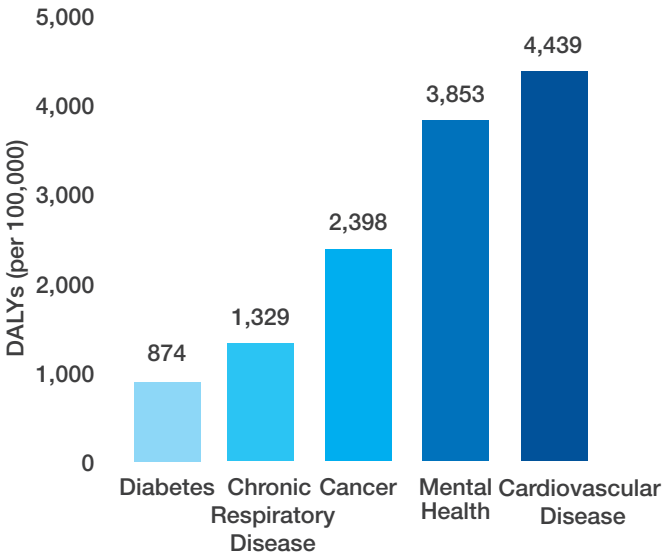
Introduction

NCDs represent one of the 21st century's most significant burdens on worldwide prosperity and productivity. NCDs accounted for the loss of 1.7 billion disability-adjusted life years (DALYs*) in 2015[2], and approximately 70% of all disability-adjusted life years lost. NCDs have historically been a problem for high-income countries (HICs**), but the rate of increase of NCDs in low-income and middle-income countries (LMICs) now outpaces the growth rate in HICs. NCDs cause 16 million premature deaths[3], and could be responsible for an estimated cumulative output loss of $47 trillion over the next two decades[4].

Impact of NCDs

In 2015, cardiovascular disease accounted for the greatest NCD burden, with close to 4,500 DALYs per 100,000 population worldwide. Mental health is the second most important NCD in terms of premature morbidity or mortality, accounting for 3,850 DALYs per 100,000 population. This is followed by cancer (2,398 per 100,000), chronic respiratory disease (1,329 per 100,000) and diabetes (874 per 100,000)[5]. See Figure 1 below.

Figure 1: Global burden of NCDs (DALYs per 100,000 population)

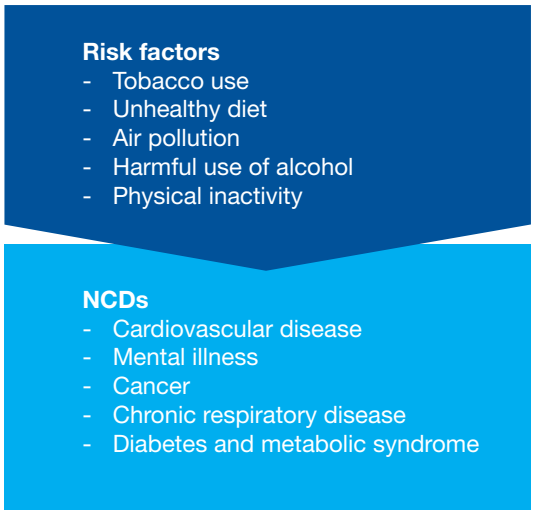


Source: Institute for Health Metrics and Evaluation. Global Health Data Exchange. Global Burden of Disease 2015. (2016) http://ghdx.healthdata.org/

Addressing the Challenge

Preventing NCDs by addressing the key risk factors will be essential to curbing their impact and will often prove more effective than concentrating on disease treatment (see Figure 2). For example, the global prevalence of tobacco consumption has declined and with it the accompanying threat of cancer, chronic respiratory disease and cardiovascular disease. Decreased air pollution has helped to curb respiratory and cardiovascular disease.

Figure 2: Risk factors and NCDs



Prevention of NCDs is often substantially less expensive than treatment and can create significant economic value. (See Table 1.)

*__Disability-adjusted life years (DALYs)__ for a disease or health condition are calculated as the sum of the years of life lost (YLL) due to premature mortality in the population and the years lost due to disability (YLD) for people living with the health condition or its consequences. In essence, one DALY represents one lost year of healthy life. DALYs vary based on population size and composition; they provide a means of assessing the gap between current health status and an ideal state of health.

**For the current 2017 fiscal year, low-income economies are defined as those with a GNI (gross national income) per capita, calculated using the World Bank Atlas method, of $1,025 or less in 2015. Lower-middle-income economies are those with a GNI per capita between $1,026 and $4,035. Upper-middle-income economies are those with a GNI per capita between $4,036 and $12,475. High-income economies have a GNI per capita of $12,476 or more. https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups

Table 1: Summary of NCD intervention benefits, costs and benefit per dollar

Target	Annual benefits ($000)*	Annual costs ($000)	Benefit for every dollar spent
Prevention			
Reduce salt content in manufactured foods by at least 30%	$12,121	$638	$19
Increase tobacco price by 125% through taxation	$37,194	$3,548	$10
Treatment			
Aspirin therapy at the onset of acute myocardial infarction (75% coverage)	$836	$27	$31
Chronic hypertension management for medium- to high-risk patients (50% coverage)	$11,410	$500	$23
Secondary prevention of cardiovascular disease with polydrug (70% coverage)	$13,116	$3,850	$3
Total	**$74,677**	**$8,563**	**$9**

Source: Nugent, Rachel. Benefits and Costs of the Non-Communicable Disease Targets for the Post-2015 Development Agenda – Post-2015 Consensus. *Copenhagen Consensus Center.* (2015)
*Authors assume the value of one averted DALY is $1,000 with 3% discounting.

Much work remains to be done. The worldwide pandemic of obesity, brought about by unhealthy diet and physical inactivity, has increased the threat of some NCDs, especially diabetes and metabolic syndrome[6,7]. The WHO reports that in 2015 nearly three quarters of countries showed poor or no progress in meeting their commitments to address NCDs. WHO stated: "Progress cannot happen without multisectoral, multistakeholder participation and partnerships, and the actions, resources, knowledge, expertise and services of non-state actors to complement the efforts of governments"[8].

Decreasing the burden of NCDs will require a transformation through which the threat of disease is recognized and addressed. The transformation should move us away from the present state of "supplier push", which emphasizes expensive, capital-intensive, hospital-centric interventions that have so far produced disappointing results, to a system that relies on "consumer pull". A consumer-focused system would recognize the principles of behavioural economics to encourage and enable people to adopt healthier behaviour across all aspects of their lives. Individuals would be supported in this effort by a network of critical stakeholders ranging from government to private enterprise, from healthcare providers to payers, from technology developers to local communities. (See Table 2.)

Table 2: Strategic changes in the health system transition

From current state	To desired state
Provider-centric system in which individual is largely passive – professionals solve problems for patients	A technology-enabled ecosystem with embedded choice architecture to encourage effective personal behaviour – individuals understand risk factors and can determine how to solve problems themselves or involve others as required
Emphasis on patient compliance with instructions	Individual understands risks and seeks support from a variety of sources to make good preventive and care decisions
Motivation for action comes from outside (care provider)	Motivation is internal – individual understands risks and has confidence to manage them
Focus on treatment of disease	Focus on prevention of disease, enabled by improved individual awareness of NCD risk factors and aided by choice architecture
Reliance on doctors and traditional providers for diagnosis Centralized, capital-intensive testing/diagnostics facilities	On-demand/continuous testing and diagnostics through wearables and other comparatively inexpensive, easily available technologies Sensors generate data that enables prevention through machine learning and connects the individuals to a broader ecosystem Diagnostic and treatment data is transferred to global databases for use by practitioners worldwide but owned by individuals
Care delivered through traditional providers and sites	A network of providers, some of whom are knowledgeable community members and paraprofessionals Individuals empowered by technology (e.g., robotics) to obtain both diagnosis and treatment in non-traditional locations
Homogeneous therapies across the population of patients for an NCD	Individualized treatment using person-specific data and machine learning

We expect these strategic shifts to drive substantial changes in the risk factor environment, which can improve health and health behaviour. (See Table 3.)

Table 3: Changes in the risk-factor environment

From current state	To desired state
Tobacco continues to be a major cause of premature death and DALYs	Tobacco use is denormalized; individual consumption rates decline rapidly in both developed and developing countries
Harmful use of alcohol contributes to lower life quality through liver damage, violence and motor vehicle accidents	Individuals use alcohol socially in moderation and use does not increase DALYs
Many find it difficult or expensive to obtain fresh, healthy food and so maintain unhealthy dietary habits	Residents of developed and developing countries find it easy to obtain fresh healthy food (healthy food becomes the default option)
Many who do not perform manual labour occupationally have little opportunity to be physically active and suffer health effects of a sedentary lifestyle	Being physically activity as part of daily life becomes the social norm across geographies and social classes
Air pollution threatens premature lung and heart disease and cancer and decreases ability to exercise	Cities and rural communities alike enjoy clean air; individual families can readily acquire home cookstoves that reduce indoor pollution
Poverty and economic inequality limit access to medical care and increase stress and likelihood of many environmentally sensitive diseases	People have adequate access to a healthy environment and to medical care if they need it

An HCHE centres on the health of the individual and the broader human population. Individuals within an HCHE take affirmative control to ensure their own well-being rather than being passive recipients of care defined and delivered by healthcare providers. In a well-functioning HCHE, people live in an environment where it is easy to:

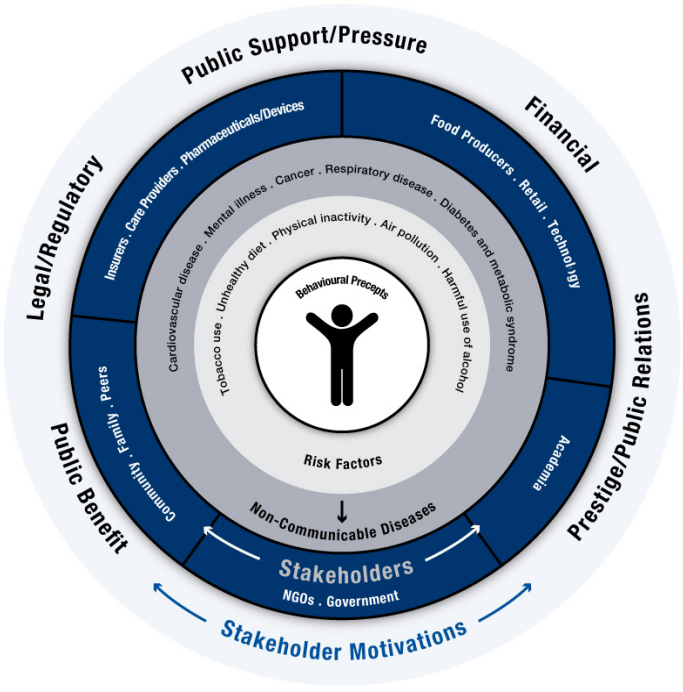
- Understand the dimensions of personal health and the factors that influence it.
- Manage their own health, using information, resources and tools to recognize and mitigate risk factors and take advantage of positive factors.
- Recognize and respond to disease when it does occur
- Identify and assess the options for action and response and choose the most appropriate.
- Access sources of response and assistance.
- Observe and measure health-related outcomes and change or continue course.

Elements of behavioural economics strongly influence whether and how people choose to act in response to the risk factors and the threat of disease. For example, people discount future benefits radically, such that they display an irrational preference for payoffs that come today. The pain of loss outweighs the pleasure of gain, so people may avoid even sensible bets. Opinions can be swayed by stories recently heard, even if they don't present all the relevant facts. People are optimistic about the future, so they don't always take precautions to forestall future hazards. These and other behavioural precepts provide the context within which people experience their interactions with the other stakeholders in the HCHE, with important consequences for individual and population health. Figure 3 illustrates the high-level components of the HCHE, with individuals in the centre.

The Human-Centric Health Project

The previous Future of Healthy project identified the need to shift towards this more human-centred approach. The two-year Human-Centric Health project aims to understand how a human-centred approach to being healthy will transform the health ecosystem, particularly in preventing NCDs. The first phase of this project developed critical knowledge and tools that focus on triggers for long-term behaviour change, leading to healthier lifestyles for the prevention of NCDs. The second phase will catalyse change by seeking opportunities for public-private cooperation for the prevention of NCDs at city level.

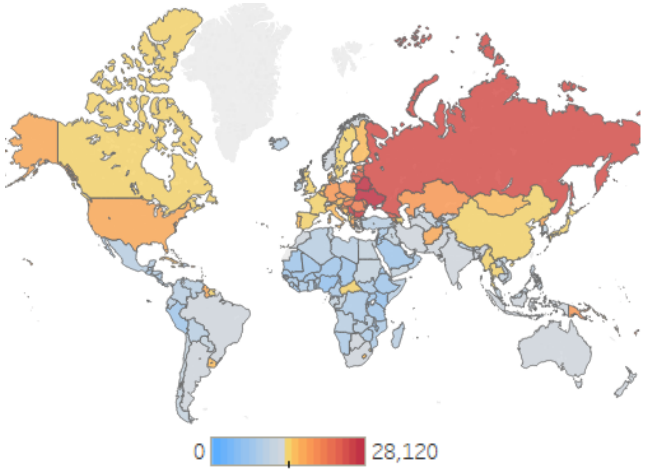
Figure 3: High-level components of the human-centric health ecosystem



Non-Communicable Diseases and Risk Factors

The global burden of NCDs at country level can be visualized using DALY data. The NCD map below (Figure 4) illustrates the current global health landscape.

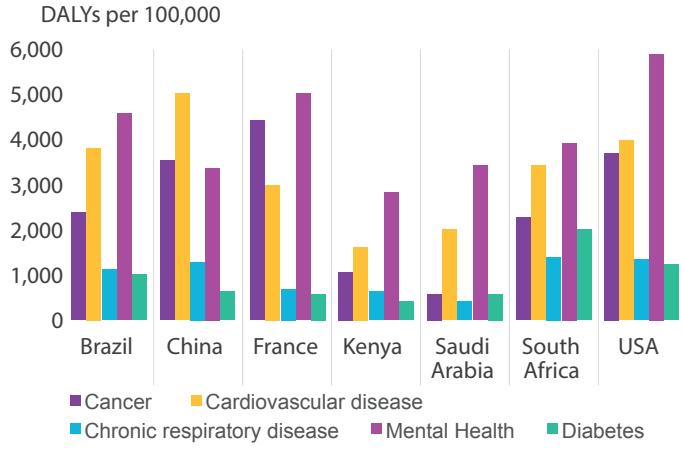
Figure 4: Global burden of NCDs in 2015 (DALYs per 100,000 population)



Source: Institute for Health Metrics and Evaluation. Global Health Data Exchange. Global Burden of Disease 2015. (2016). Interactive version of the map available at https://www.weforum.org/pages/non-communicable-diseases-heat-map

Figure 5 below shows the extent to which each of seven focus countries* currently experiences NCDs to varying degrees of severity. On a per capita basis, the United States experiences the highest burden of NCDs, followed by China and France, while Kenya and Saudi Arabia have a comparatively lower burden of NCDs. Within each of the seven countries, cardiovascular disease and mental health cause the majority of the total burden of NCDs. This is also true globally.

Figure 5: Burden of NCDs for the seven countries of focus, broken down by disease type (DALYs per 100,000 population)

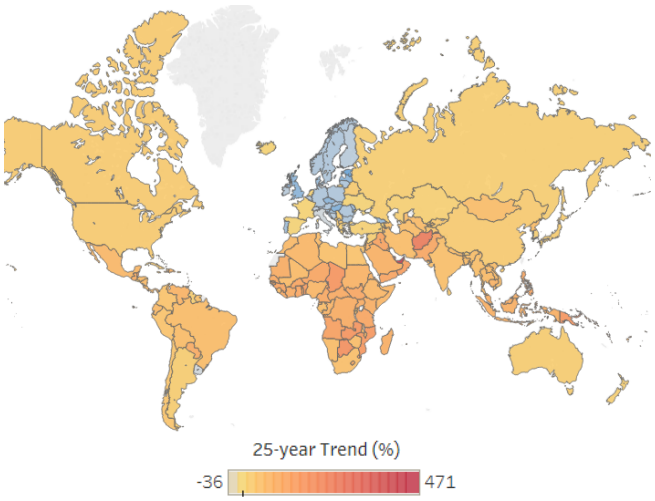


Source: Institute for Health Metrics and Evaluation. Global Health Data Exchange. Global Burden of Disease 2015. (2016). http://ghdx.healthdata.org/

NCD Trends

Although current DALY data provides a good snapshot of health globally, trend data can provide insights into areas of growing concern. Trend information also shows how countries, through economic development and improvements in medical care and public health, have experienced an epidemiological shift from infectious disease to NCDs. Figure 6 maps the trend in burden of NCDs with data spanning the 25-year period from 1990 to 2015.

Figure 6: 25-year change in burden of NCDs (DALYs per 100,000 population)



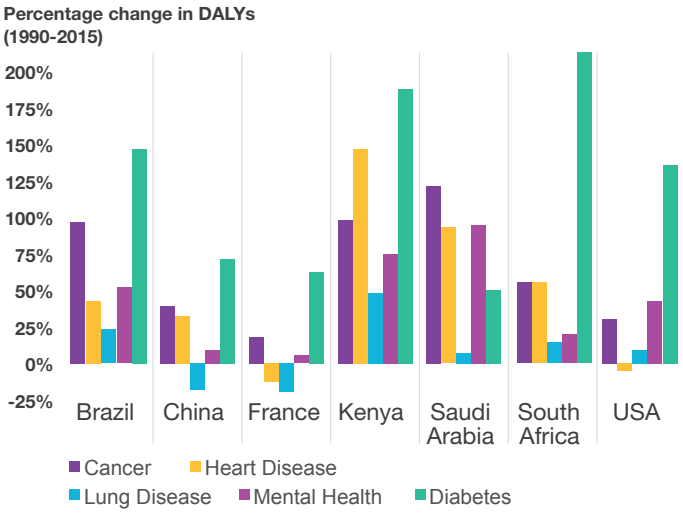
Source: Institute for Health Metrics and Evaluation. Global Health Data Exchange. Global Burden of Disease 2015. (2016). Interactive version of the map available at https://www.weforum.org/pages/non-communicable-diseases-heat-map

As Figure 7 shows, over the past 25 years the African continent has experienced the greatest increase in burden attributable to NCDs. Although African countries have yet to experience the high rates of DALYs for NCDs observed among HICs today, the 25-year trends for these diseases show that the fight against the burden of NCDs will be both global and long-lasting.

Figure 7 demonstrates that, while a static overview of a particular NCD confirms its impact on a country in any one year (in this case 2015), trend data can help identify where a condition is emerging and likely to represent a future economic burden. The results, broken down by the five most prevalent NCDs, are based on DALY data from 1990 to 2015.

*To narrow the NCD and risk factor analysis, we have chosen to analyse a group of countries that represents a range of income levels and global locations. The seven countries are: Brazil, China, France, Kenya, Saudi Arabia, South Africa and the United States.

Figure 7: 25-year change in burden of NCDs for the seven countries of focus by disease type (1990-2015)



Source: Institute for Health Metrics and Evaluation. Global Health Data Exchange. Global Burden of Disease 2015. (2016). http://ghdx.healthdata.org

Cardiovascular disease, as the single most important NCD in terms of DALYs globally, has a significant impact on the seven countries of emphasis. This is particularly true for Brazil, China and the United States. Kenya and South Africa have seen a major increase over the past 25 years.

Mental illness, the second most important NCD in terms of DALYs, has a heavy impact on the seven focus countries, and on the United States, France and Brazil in particular. Trend data indicates a significant increase in burden of mental illness for Saudi Arabia and Kenya.

Cancer is a high burden in China, France and the United States. The trend data suggests a growing concern for Brazil, Kenya and Saudi Arabia, where DALYs have doubled in the past 25 years. Note that countries with lower current NCD impact have much higher trends, portending high potential future impact of NCDs.

Chronic respiratory disease poses a major concern for Brazil, China, South Africa and the United States. Although our data shows a declining trend for China, this disease is increasing significantly in Kenya.

Diabetes and metabolic syndrome represent a major current concern for South Africa, the United States and Brazil. The figures also highlight a growing crisis for Kenya and South Africa, which have seen the diabetes burden triple in the past two decades. The burden of disease associated with diabetes in Saudi Arabia has risen by 50%. With a growing population of people with high body mass index (BMI, defined under Table 4), likely onset of diabetes in the future is cause for concern.

These results highlight that, although HICs currently face a large economic burden, lower-income countries such as Kenya and upwardly mobile economies like Brazil face substantial emerging NCD challenges. Countries currently experiencing a high burden of NCDs, coupled with a high projected increase in disease burden over the past 25 years, face a particularly urgent need to mobilize resources to deal with current and likely future challenges. This is true for diabetes in South Africa, for example, which suffers from the highest rate of diabetes-related DALYs among the seven countries, as well as the highest increase over the past quarter century.

NCD Risk Factors

A human-centric approach that seeks to address the threat of NCDs in part through individual behaviour and consumer choice must address the risk factors that cause and exacerbate disease. Our analysis concerns itself with five risk factors:

- Tobacco use
- Unhealthy diet
- Air pollution
- Harmful use of alcohol
- Physical inactivity.

Table 4 illustrates the prevalence of each risk factor for each country of focus.

Table 4: Risk factor prevalence by country

Risk factors	Tobacco consumption (%)	Prevalence of BMI ≥30kg/m2	Air pollution (annual mean concentration of PM2.5) [ug/m3]	Total alcohol consumption (litres of pure alcohol)	Prevalence of physical inactivity (%)
Brazil	15.3	20.0	11.3	8.7	27.2
China	24.7	6.9	59.5	6.7	23.8
France	27.7	23.9	12.6	12.2	26.4
Kenya	13.4	7.0	16.8	4.3	16.9
Saudi Arabia	15.4	34.7	127.1	0.2	58.5
South Africa	19.0	26.8	31.3	11.0	47.1
USA	17.3	33.7	8.4	9.2	35.0
Global Average	**21.5**	**13.0**	**29.2**	**6.2**	**31.0**

Source: World Health Organization. Global Health Observatory (GHO) data. The data repository. (2016). http://www.who.int/gho/database/en/

Definitions

Tobacco consumption[9] – Prevalence of current smoking of any tobacco product by persons aged 15 years and older. Includes cigarettes, cigars, pipes or any other smoked tobacco products; both daily and non-daily or occasional smoking.

Prevalence of high BMI[10] – Percentage of population aged 18 years and older with a BMI of 30 or higher. Measured using weight in kilograms divided by the square of height in metres.

Air pollution[11] – The mean annual concentration of fine suspended particles of less than 2.5 microns in diameters. Measured by micrograms per cubic meter.

Total alcohol consumption[12] – The total alcohol per capita consumed by people aged 15 years and older.

Prevalence of physical inactivity[13] – Percentage of population aged 18 years and older attaining less than 150 minutes of moderate-intensity physical activity per week, or less than 75 minutes of vigorous-intensity physical activity per week.

Highlights of the risk factor analysis

- Among the seven countries of focus, France and China have the highest prevalence of tobacco use.
- More than one-third of the adult population of Saudi Arabia and the United States have a BMI greater than 30 (the indicator of obesity).
- Measured by the annual mean concentration of urban particulate matter of less than 2.5 microns in diameter, Saudi Arabia experiences the most severe rates of outdoor air pollution. Desert dust contributes to this problem. China and South Africa also have significant air pollution concerns. A different form of pollution – the smoke from open indoor fires and traditional cookstoves – also poses health and environmental problems globally. Household air pollution worsens chronic respiratory disease and cardiovascular disease, as well as lung cancer, strokes and pneumonia. Lower-income countries such as Kenya, which largely avoid the problem of outdoor air pollution, suffer disproportionately from problems of indoor air quality.
- Among the seven focus countries, France is the highest consumer of alcohol, followed by South Africa, the United States and Brazil.
- Populations in Saudi Arabia, South Africa and the United States are among the most physically inactive.

Although not formally identified as an NCD risk factor, **oral infections**, specifically periodontitis, increase the risk of a range of systemic conditions, including diabetes, pulmonary infection and cardiovascular diseases[14]. Periodontitis has also been associated with several specific biomarkers of cardiovascular disease. Researchers hypothesize that an individual's propensity for hyper-responsiveness to inflammation may at least partly explain how periodontal disease might be associated with cardiovascular disease[15].

The global increase of NCDs has been driven by a combination of personal behaviour and environmental conditions. Individually and collectively, these can increase a person's likelihood of experiencing one or more NCDs or worsen the impact of an existing disease state. The opportunity to respond to these threats lies in building a culture of health and creating a society that gives everyone an opportunity to live the healthiest life possible, regardless of ethnicity, geography, race, socioeconomic status or physical circumstances.

Using Behavioural Economics to Address NCDs

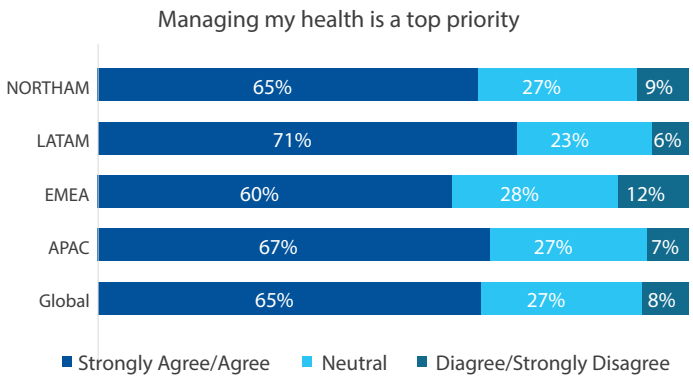
Precepts of behavioural economics have a profound impact on how people respond to the risk factors for NCDs. As humans make decisions in the context of these behavioural influences, they use various heuristics to make choices that do not always support good health. This method of human decision-making helped ensure the survival of prehistoric clans and saves modern people from being paralysed by the thousands of decisions that take place daily. However, these hard-wired, largely automatic rules of thumb often impair the ability to make the choices that can prevent death and disability and increase economic production.

Here we review some of the precepts of behavioural economics that relate to healthy decisions and present suggestions for how to use them to increase the healthy behaviour of the population within the context of the HCHE.

Making Choices about Health

If you ask, almost everyone will tell you that managing personal health is important. Our research into health-related behaviour reflects this (see Figure 8).

Figure 8: Importance of managing personal health



Source: Willis Towers Watson. *Global Benefits Attitude Survey.* (2015).

Note: Willis Towers Watson Global Benefit Attitudes Survey was completed by 29,629 individuals in 19 countries in summer, 2015.

Region definitions

APAC (Asia-Pacific) – Australia, China, India, Japan, Philippines, Republic of Korea

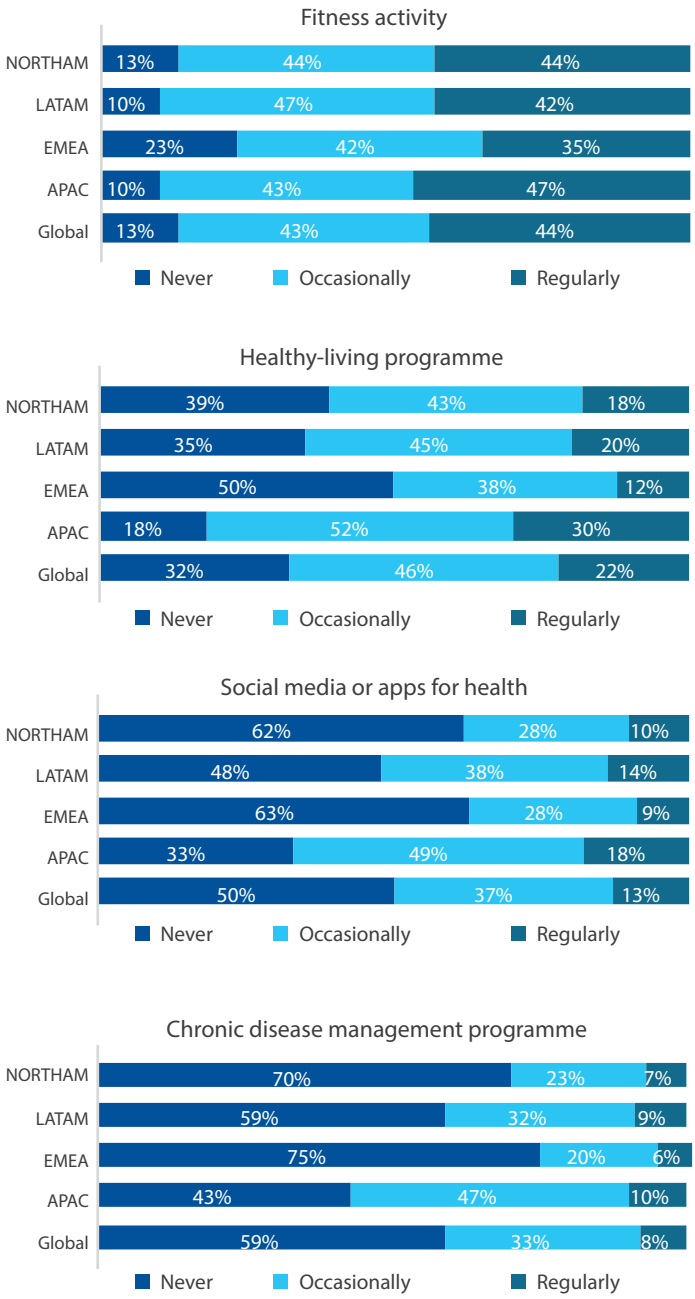
EMEA (Europe and Middle East) – France, Germany, Ireland, Netherlands, Turkey, United Kingdom

LATAM (Latin America) – Argentina, Chile, Brazil, Colombia, Mexico

NORTHAM (North America) – Canada, United States

Taking effective action, however, is frequently challenging, as the data in Figure 9 suggests.

Figure 9: Frequency of engaging in health activities



Source: Willis Towers Watson. *Global Benefits Attitude Survey.* (2015).

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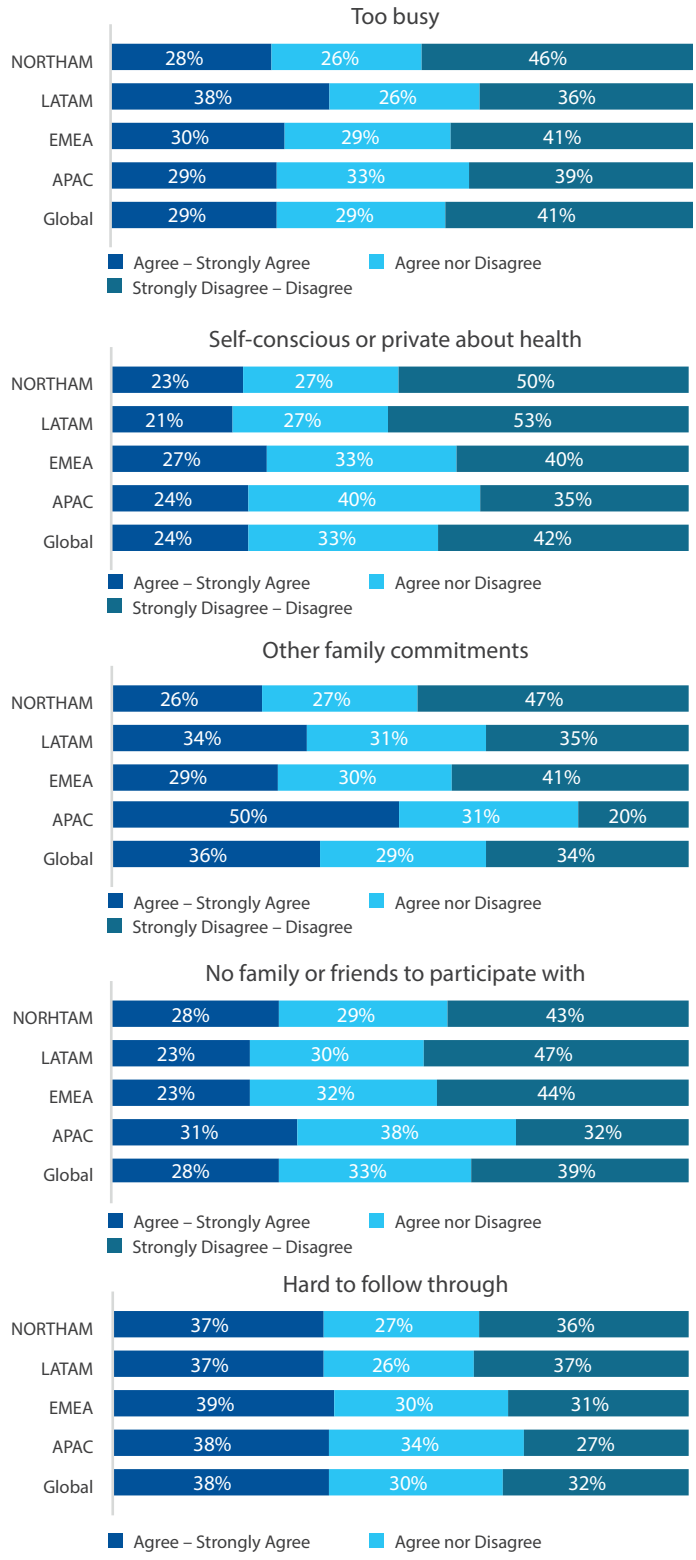
What do people say stands in the way of decisions to live healthier lives? Figure 10, below, offers some clues.

Figure 10: Influencers of the decision to live a healthy lifestyle

To what extent to you agree or disagree with the following statements about living a healthy lifestyle?



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Forty percent of respondents cited difficulty following through on commitments as the main factor keeping them from living healthy lifestyles. Respondents from Latin America, as well as those from France (36%) were especially likely to cite lack of available time as the explanation for inactivity. Family commitments represent one key cause of the perceived time constraints, especially in the Latin American and Asia-Pacific regions. In Brazil, 35% of respondents said family commitments left too little time to pursue a healthy lifestyle; the percentage in China was 54%.

Behavioural economics

These examples of consistent failure to adopt healthy behaviour, despite an avowed understanding of the importance of personal health, stem from the automatic, heuristic-based decision-making that protects people from investing too much cognitive energy in routine choices. People tend to reserve conscious reasoning capacity for more complex decisions. Hence, making healthy behaviour automatic and easy is a key to reducing NCD risk factors. For example, powerful narrative stories make risks immediate and compelling and can encourage healthy choices. Healthy behaviour can ripple through social networks, bringing the weight of group norms to bear on individual decisions. Loss aversion and choice architecture can be exploited to encourage health-promoting activity.

We will review some of the more powerful behavioural economics precepts that can encourage healthier behaviour within the context of the human-centric health ecosystem.

Present bias

When humans want something, they want it now. People value future earnings, future happiness and future health much less than any rational discounting model would suggest. Harmful sweets are immediately gratifying; the diet can start tomorrow. Nicotine and alcohol bring pleasure in the moment, so users become physically addicted to tobacco and use more alcohol than is healthy. Similarly, as Figure 10 shows, people find it difficult to make the changes needed now to protect health. Instead, they are more willing to make commitments about future actions than about actions today.

Understanding present bias suggests approaches that can improve healthy behaviour:

- Offer opportunities for individuals to commit to better behaviour in the future rather than today. This strategy is used successfully in tobacco cessation programmes and can be employed to increase exercise.
- Present choices that bundle a current pleasure with a behaviour that will lead to better health in the future, like giving recognition and rewards to those who exercise regularly.
- Emphasize the near-term advantages of healthy behaviour rather than the benefits that might be achieved (or the harm that might become apparent) decades later. Front-loading rewards for initiative helps overcome our natural propensity to procrastinate or make excuses for inaction.

Case study: Food banks contribute to diabetes care

As the diabetes epidemic has worsened, food banks in the US have emerged as partners with healthcare providers in the effort to address both food insecurity and the effects of diet on diabetes. Although food banks were originally established to meet emergency needs, food insecurity has become a widespread problem in the US. Thus, many food banks serve the same clients repeatedly over months or even years. The populations they serve often experience the highest risk of diabetes and typically have infrequent access to medical care.

Between February 2012 and March 2014, a team headed by Hilary Seligman, Associate Professor of Medicine and of Epidemiology and Biostatistics at the University of California, San Francisco (UCSF), studied the effectiveness of using the food bank network to provide clients with diabetes-appropriate food, blood-sugar monitoring, primary-care referral and self-management support. The team enrolled 687 food-pantry clients who suffered from diabetes and were clients of food banks in three cities in Texas, California and Ohio. During the enrolment period, food-bank staff provided pre-packed boxes containing whole grains, lean meat, beans, low-sodium vegetables, no-sugar-added fruit and shelf-stable dairy products. The boxes were supplemented with perishable items, including fresh produce, milk, yoghurt, cheese, bread and frozen lean meat. Staff also conducted free diabetes screening for all adults and used surveys to assess self-management behaviour and determine how often the study participants put off buying food to buy medicine, or vice versa.

Pre/post-study comparisons showed improvements in glycaemic control, fruit and vegetable intake and reported self-efficacy in disease management and medication adherence.

NCDs	Risk factors	Behavioural triggers
Heart disease Diabetes/Metabolic syndrome	Unhealthy diet	Present bias Loss aversion Social norms Choice architecture

Loss aversion

People experience the pain of loss more deeply than the pleasure of gain[16]. This suggests that "sticks" are more likely to motivate individuals than economically equivalent "carrots". Many recent studies of incentives to encourage smoking cessation or improve medication adherence were designed to offer a payment at the outset, with a provision that the payment would be forfeited if the patient were unable to keep the commitment to quit smoking or take medications regularly[17]. People have used "commitment contracts" to encourage themselves to study or exercise[18]. Failure to keep the contract means having to pay the amount of their commitment contract.

Ways to take advantage of loss aversion to improve personal health:

- Configure positive incentives so they can be taken away. It is not usually feasible to penalize people for unhealthy behaviour, as this feels unfair and can lead to resentment and adverse behaviour. However, positive incentives can be reframed so that they are granted but can be withdrawn, such as a bonus for adherence to a medical regimen. This approach gives the positive incentive the decision-driving power of a penalty.
- Price products such as cigarettes and unhealthy food high enough that consumers are discouraged from buying them.
- In education campaigns, emphasize losses from unhealthy behaviour, as opposed to future gains from making healthier decisions. For instance, point to bad breath and facial wrinkles from cigarette smoking, rather than extra lung capacity after quitting.

Case study: Diabetes Prevention Program (DPP) connects government, non-profit and companies

The Diabetes Prevention Program (DPP) was initially funded by the National Institutes of Health. The lifestyle intervention – a series of 16 classes over 16 weeks – decreased the onset of type 2 diabetes by 58%, a result that surprised even the researchers. Lifestyle changes worked particularly well for participants aged 60 and over, reducing their risk by 71%.

Participants succeeded in losing, on average, almost 5% of their body weight, making this an especially effective non-surgical approach to obesity. Weight loss has consistently been associated with the largest decrease in risk of conversion to diabetes. The DPP was shown to be effective across genders, ethnicities and age groups. About 5% of the lifestyle intervention group developed diabetes each year during the study period, compared with 11% of those in the placebo group.

The DPP curriculum has been published by the Centers for Disease Control and Prevention in the United States, which also offers a certification to non-profits and companies wishing to administer the DPP. The programme has been rolled out in more than 200 YMCAs across the US and in a number of other countries. Researchers have estimated that expansions of this intervention could save up to $15 billion over a decade.

A number of companies, including Newtopia, Omada, Retrofit and United HealthCare, have commercialized the DPP. In many instances, organizations have converted the in-person meetings to mobile applications without sacrificing the important social network element of the intervention.

NCDs	Risk factors	Behavioural triggers
Heart disease Diabetes/Metabolic syndrome	Tobacco use Unhealthy diet Physical inactivity	Loss aversion Framing Availability/Narrative Optimism Social norms

Framing

Context matters. The same car looks expensive in a showroom of economy cars but seems like a bargain in a line-up of luxury cars. A disease seems less dreadful when the consequences are expressed as a survival rate rather than a mortality rate, even if the results are equivalent[19].

Actions that exploit framing to improve health choices:

- Emphasize the benefits that can be achieved through a specific action (e.g., improving quality of life; having more years to spend with the grandchildren).
- Position benefits as altruistic and therefore intrinsically fulfilling. For example, successful vaccination programmes urge people to get shots to protect others.
- Emphasize the ease of healthy behaviour compared with many of the other activities that people voluntarily choose.
- Frame behaviour change to avoid focus on loss. For instance, underscoring the benefits of eating more vegetables rather than the sacrifice associated with eating fewer cupcakes.

Availability/Narrative

People respond to what is most immediate and most familiar to their everyday experiences. Learning that a quarter of a million people have died in a natural disaster is less likely to motivate charitable giving than a heart-warming description of a child who needs surgery for a cleft palate[20]. Similarly, people worry far more about dying in a plane crash than in a car accident, even though the likelihood of a fatal car accident is 100 times higher per mile travelled. A plane crash has more narrative force than bland statistics about tens of thousands dying in more commonplace car accidents.

Ways to take advantage of the availability heuristic to improve health decisions:

- Tell compelling stories with familiar examples to drive an increase in healthy behaviour. Stories must reflect facts accurately, although data alone is unlikely to drive change. Rather than simply instructing people about how much their mortality risk increases for each year of cigarette smoking, show them a picture of a diseased lung.
- Use statistics to determine risks on which to focus, but de-emphasize dry, impersonal data when communicating risk. Instead, highlight easy-to-remember "that-could-happen-to-me" facts. Instead of saying, "Smoking accounts for 30% of all cancer deaths", tell a smoker, "Smoking is associated with 15 different kinds of cancer and your risk of lung cancer is 23 times higher if you smoke".

Social norms

Risk factors for NCDs often travel in social circles. Those who are married to or friendly with smokers are more likely to smoke. Research indicates that new incidence of obesity correlates highly with social network membership and appears to have an epidemiological pattern similar to viral infections[21]. Within groups, some people are influencers who have the power to guide the decisions of those around them. Marketing experts frequently use networks of influencers to encourage various shopping or other consumer behaviours[22]. The fit and upbeat office wellness champion who speaks glowingly of a recent sports activity can attract others to participate.

Actions that take advantage of social connections to improve health:

- Try to gain the attention of influencers whose personal behaviour sets an example for their social networks.
- Incorporate social media into information campaigns and mutual support efforts.
- Ask people to make public commitments to future change, which can dramatically increase success at behaviour change.
- Get people to join a group health-improvement effort, such as a weight-loss or steps-walked team challenge.

Case study: Good oral health can reduce risk of NCDs

As with other risk factors, oral health can be improved through specific actions that reduce the risk of related NCDs. Intervention to encourage good oral health in children can be especially important. For example, a team of researchers evaluated the effect of a two-year oral health education programme conducted among three-year-old Chinese children in the Beijing region. Oral health education sessions were conducted for the test children monthly and for their parents semiannually. Children in the test kindergarten brushed their teeth twice daily with fluoridated toothpaste under the supervision of kindergarten teachers. The control populations received no oral health education and performed no supervised tooth-brushing. An evaluation conducted at the end of the programme indicated that the test group had approximately 31% fewer decayed, missing and filled teeth than the control group. In addition, a significantly higher percentage of children in the test group than in the control group reported brushing their teeth twice a day (87.6% versus 69%).

Given the links between oral health and NCDs, dentistry professionals can play an important role in identifying and providing care and counsel to individuals at risk. For example, a dentist who notices that a patient with diabetes smokes could inform the patient of the links between tobacco use and oral cancer. The dentist could also explain that tobacco use can increase diabetes complications, including periodontal disease, and strongly urge the patient to see a primary care physician for further diagnosis and treatment.

NCDs	Risk factors	Behavioural triggers
Heart disease	Unhealthy diet	Framing
Diabetes/Metabolic syndrome	Tobacco use	Choice architecture
	Harmful use of alcohol	Social norms

Choice architecture and defaults

The modern world offers seemingly endless opportunities for customization. Computers, smartphones, cars and even fridges can be fine-tuned to meet individual needs and desires. Nonetheless, most people don't change the factory settings on their laptops or the ring tones on their phones. Some voters automatically select the first candidate on a ballot; shoppers are most likely to pick groceries from shelves at eye level. Staying with a default takes less energy than making an active decision and allows people to focus attention on more important concerns. Choice architecture means presenting options to maximize the chance that people will make the optimal decision.

Ways to recognize choice architecture and defaults to improve healthy behaviour:

- In shops, display healthy food prominently, giving unhealthy items a less favourable position so that buying nutritious items is the easier choice.
- In cafeterias, offer a healthy meal accompaniment (like an apple) as a default and require extra effort to acquire the less healthy option (such as a cake).
- In restaurants, offer smaller standard portions with free or low-cost refills, rather than large quantities of food or drink. The default is to eat what is presented, so consumption may decrease when portions shrink and obtaining extra food requires effort.
- Design buildings so that stairways are open and accessible and lifts require extra steps to reach.
- Make it easy to walk, and difficult to drive, in a downtown area.

Case study: Integrating maternal health and mental care in South Africa

Despite high levels of antenatal and postnatal depression, there is no routine screening or treatment of maternal mental disorders in primary-care settings in South Africa. Antenatal care focuses predominantly on physical examination. During the post-partum period, the healthcare focus is commonly on the infant for immunization, growth monitoring and HIV testing. The lack of integration between maternal health services, child health services and mental health services in primary care creates a gap in the screening and treatment of maternal mental disorders.

In response to this need, the Perinatal Mental Health Project (PMHP), based at the Mowbray Maternity Hospital in the Western Cape Province of South Africa, has integrated a maternal mental health programme into the antenatal care process. Midwives in the hospital's Midwives Obstetric Unit (MOU) are trained to screen women routinely for maternal mood disorders during their antenatal visits, using the Edinburgh Postnatal Depression Scale (EPDS). The midwives refer women deemed to be at high risk for depression or other disorders for on-site counselling, which may coincide with subsequent antenatal visits.

From July 2008 to the end of June 2011, 90% of the women who attended the facility for primary care were offered mental health screening; 95% of those accepted the screening. Of the women screened, about one third qualified for referral to a counsellor and 62% of those who qualified agreed to be referred. A 2011 analysis of self-reported data from a sample of women receiving counselling showed that six to 10 weeks post-partum, 88% reported an improvement in their presenting problem and 80% reported to be coping at least adequately. About three quarters reported a positive mood at the time of the phone assessment.

NCDs	Risk factors	Behavioural triggers
Mental illness	Unhealthy diet Harmful use of alcohol Physical inactivity	Choice architecture/ Default Social norms

Case study: Ciclovías promote physical activity, yield benefits at low cost

The *Ciclovía recreativa* is a community-based programme in which streets are temporarily closed to motor vehicles, allowing exclusive access to individuals for leisure and physical activities. Currently, Ciclovía programmes exist in at least 16 countries in the Americas and the Caribbean. Funding for the programme can come from any one of several sources: general municipal budgets, sports and recreation department funds, private sponsors and, in the case of Bogotá, Colombia, a tax added to all citizens' phone bills.

In 2011, a team of researchers published an economic analysis of the programmes in four cities: Bogotá and Medellín, Colombia; Guadalajara, Mexico; and San Francisco, California. Programme costs considered in the analysis included employee salaries and expenses for logistical and technical support. The analysis also took into account user costs such as bicycle helmets. The research team defined the direct health benefit from the programme as the amount of money a physically active adult would save in annual direct health and medical costs for preventing chronic diseases.

The annual cost per capita of the programmes was $6 for Bogotá, $23.40 for Medellín, $6.50 for Guadalajara and $70.50 for San Francisco. These investments yielded a benefit-to-dollar-cost ratio of 3.23-4.26 for Bogotá, 1.83 for Medellín, 1.02-1.23 for Guadalajara and 2.32 for San Francisco. The researchers concluded: "The very low per user costs of the Ciclovías in comparison with other programmes for physical activity promotion are striking. Clearly, using existing infrastructure built and maintained for motorized transport contributes substantially to the positive cost-benefit ratio. The large number of users, and the potential for an even greater proportion of urban populations to participate in Ciclovías due to the ubiquitous presence of road networks and their relative underutilization during certain hours suggests that with appropriate multisectoral partnerships, political support and effective management and promotion, many more cities can support Ciclovías".

NCDs	Risk factors	Behavioural triggers
Heart disease Diabetes/Metabolic syndrome Mental illness Cancer	Physical inactivity	Choice architecture/ Default Social norms

Optimism

Humans are an irrationally optimistic species. This trait served us well in prehistory when people often existed at the edge of malnutrition and needed hope to venture out into a dangerous world to find the next meal. Optimism serves a purpose today as people compete for jobs, love and success. Lottery ticket purchasers know the odds are stacked against them, but they feel lucky and buy the weekly ticket thinking it could be the one that makes them rich. Optimism makes smokers certain they won't be among the unfortunate many who will suffer from severe lung disease.

Approaches to take advantage of optimism to improve health decisions:

- Include a lottery element in health incentives to gain substantial attention for modest cost[23,24].
- Emphasize personal accomplishment in achieving healthier behaviour – playing to positive self-image. Telling someone, "You look great after thinning down", can provide powerful motivation.
- Not expecting that exhortations of future harm will be highly motivating. Figuring present bias into the equation makes it clear that the decades-away threat of respiratory disease is too weak to motivate an optimistic smoker to quit today.

Depletion

People have limited attention. As shown in Figure 10, the perception of constrained time and numerous demands reduces the likelihood that people will make the effort to improve their health. Even self-control might be a limited resource[25]; exercising the discipline needed to go to the gym after work might reduce the ability to resist a pizza later. One recent study showed that diabetics lost less weight when they used a wearable device that tracked their activity. It may be that, having invested substantial mental energy to persist in achieving 10,000 steps, they were left without the psychological strength to avoid high-calorie foods[26].

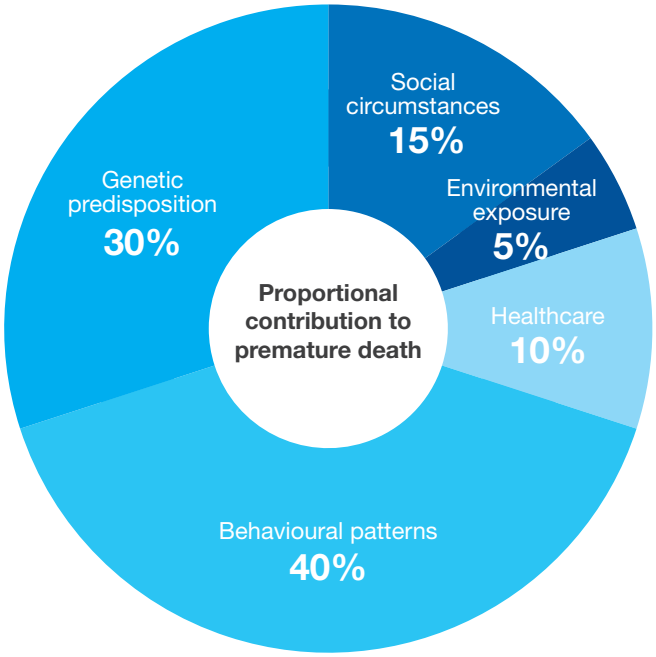
Ways of using depletion to improve health decisions:

- Make sure that the decision to participate in a healthy activity requires no conscious decision at all whenever possible.
- Do not overwhelm people with too many choices. Physicians should not give a dozen new instructions to a patient and expect adherence. Instead, give a small prioritized list and use once-a-day pills that will address multiple conditions.
- Focus attention on approaches that have the most potential benefit while requiring the least cognitive effort of the target population. For instance, display the apples at the front of the shop and stack the candy at the back.

Designing systems to encourage healthier behaviour within the HCHE requires recognition that people have a strongly developed sense of fairness[27]. This means avoiding programmes that will appear unfair. For instance, offering a reward for achieving a specific BMI that feels unachievable to many will be demotivating for obese individuals, will feel unfair to all and will likely lower the credibility of any associated programming[28].

As Figure 11 below suggests, individual behaviour, influenced by all the factors discussed here, is an important element in the determination of one ultimate measure of personal health. Clearly, however, other factors enter the picture as well. For example, healthcare availability as well as quality and social and environmental factors together account for about 30% of the contribution to premature death. The HCHE must incorporate these multiple levels of effect, ranging from the personal to the institutional.

Figure 11: Impact of various factors on risk of premature death



Source: Schroeder, S.A. We Can Do Better – Improving the Health of the American People. *N Eng J Med.* 357, 1222 (2007).

Moreover, people express widely differing opinions on the relative roles of government and of the private sector in supporting individual health and delivering healthcare service. Writing in *Health Affairs*, a team of researchers segmented the population of the US into a series of groups based on two dimensions: their beliefs about how strong a role the federal government should play in population health; and their attitudes toward the importance of personal health. The group that scored high on both dimensions was labelled Committed Activists. The research team used the term "Self-Reliant Individualists" for the group that expressed high interest in personal health but advocated little government involvement. But when it came to considering how to balance between government and private sector responsible for health support, the two groups differed significantly, as Table 5 shows.

Table 5: How two segments of the American population differ on government and private-sector involvement in health

Survey question	Committed activists	Self-reliant individualists
Improving health of American people should be a top federal priority	58%	11%
Making sure all communities are healthy places should be a top priority	97%	42%
Private sector should be responsible	7%	22%
Government (or both) should be responsible	85%	13%
Making sure that healthy, affordable foods are available	99%	78%
Private sector should be responsible	13%	29%
Government (or both) should be responsible	81%	11%

Source: Bye, L., Ghirardelli, A. & Fontes, A. Promoting Health Equity and Population Health: How Americans' Views Differ. *Health Affairs*. 35(11), 1982-1990 (2016).

The study authors emphasize that individual choices, however influenced, take place within a social context. They also say that,

> …educating the public about the effects of social determinants on health is challenging because many Americans view personal health behaviour and medical care access as the only consequential influences on health outcomes. Work to date indicates that effective messaging should acknowledge the role of individual decisions but should reinforce the greater importance of social influences. It may be possible to use this framing along with compelling personal narratives and visual images to move Americans' beliefs about the effects of social determinants on health[29].

In their view, factors like framing and availability can influence not only individual health transactions but also people's support for the broader HCHE.

Case study: Cities changing diabetes

In Copenhagen, Denmark, the number of people with diabetes is expected to double by 2040 if no action is taken. Despite relatively high diagnosis (74%) and treatment (98%) rates, many vulnerable, hard-to-engage citizens are at particular risk of developing diabetes and related NCDs.

The city's diabetes challenge was mapped out qualitatively with a semi-ethnographic "vulnerability assessment" of social factors and cultural determinants of health. The research identified groups of citizens and neighbourhoods with particular needs and led to the identification of four joint action pilots to supplement prior city initiatives. The action plan intends to use a number of behavioural precepts, including social norms, for engagement of vulnerable groups and communities and to improve local environments through use of choice architecture. The research insights also informed an update of the city's diabetes strategy.

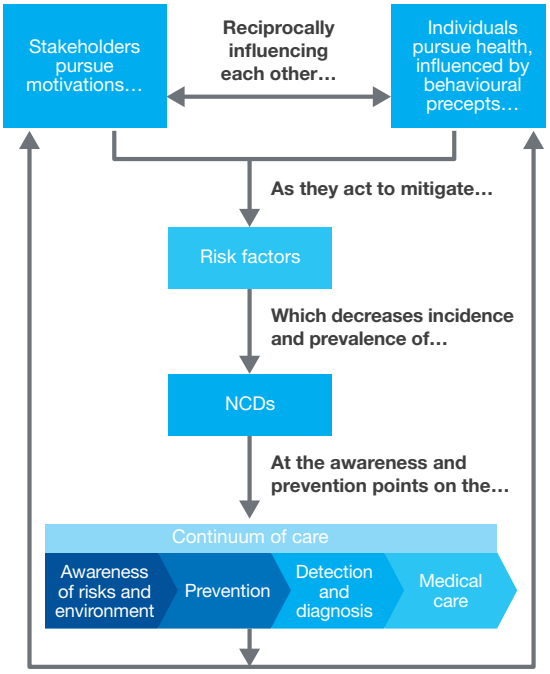
The city recently opened a diabetes centre to provide disease-management support to all citizens with diabetes. The immediate goal of the programme is to ensure that diabetes appears prominently on the city's health agenda. The long-term objective is to monitor and lower the prevalence of diabetes, reduce related health complications and empower citizens (especially those that are vulnerable or hard to reach) to lead long and healthy lives. Programme success will help realize the city's health mantra, "'Enjoy Life, Copenhageners".

NCDs	Risk factors	Behavioural triggers
Diabetes/Metabolic syndrome	Tobacco use Unhealthy diet Physical inactivity Harmful use of alcohol	Choice architecture Social norms

Human-Centric Health Ecosystem and Three Stakeholder Sectors

An HCHE is most likely to become and remain viable when stakeholders' actions (as influenced by their motivations) align with individuals' behavioural choice tendencies. The most robust health ecosystem will resemble a consumer purchase model. Informed buyers will express demands that support their own well-being and stakeholders will achieve success by recognizing and meeting those demands. Drawing on the elements depicted in Figure 3, we can think of a functioning HCHE as a flow process.

Figure 12: The HCHE in flow form



Within the HCHE, interactions among individuals and stakeholders occur along a spectrum of health-risk recognition points and responses to disease. For this discussion, we have identified four points at which individuals and stakeholders may interact in response to a risk factor or an NCD. These points are:

- **Awareness of risks and environment** – Individuals have sufficient information to be aware of the risk factors and cognizant of the implications of NCD threats. Awareness incorporates health education and also involves understanding the opportunities for action afforded by the HCHE environment.
- **Prevention** – Individuals have the insights and environmental support required to take effective action to address risk factors and avoid NCDs.
- **Detection and diagnosis** – People have access to health providers and resources to recognize and assess early signs of disease and plan effective responses.
- **Medical care** – Care providers help individuals prevent disease or take early action to mitigate symptoms; care continues as necessary to minimize NCD progression and the risk of premature death or long-term deterioration of life quality.

Three Emerging Sectors with Potential for High Impact on NCDs

We have focused on three sectors – insurers, retailers and technology – that are playing an increasingly important role in risk-factor response and NCD prevention. Insurers, healthy food companies, software producers, computer makers, artificial intelligence developers, and sports and leisure companies are forming a new ecology that places health – not healthcare – at the focal point of business strategy. Examining some of their approaches illustrates how stakeholder actions call into play behavioural precepts and contribute to the HCHE.

Insurers

Insurers most typically provide funding for care delivered through a formal healthcare delivery system (doctors, hospitals and clinics, for example). Residents in high-income countries are nearly four times more likely than those in low-income countries to have NCD services covered by health insurance. Countries with inadequate health insurance coverage struggle to provide broad access to essential care for NCDs. In LMICs, healthcare costs from cardiovascular disease, cancer, diabetes and chronic lung diseases can drain household resources, driving families into poverty and stifling economic development[30]. The impact of NCDs can reduce the supply of available labour, reduce labour productivity and cause redirection of investment that could otherwise go to building productive resources. Families with NCD sufferers but without health insurance may find it necessary to reduce other purchases, use savings, sell assets, borrow money or delay investments to pay medical bills. Resources to fund health treatment are, therefore, especially critical in LMICs, given that the health burden of NCDs is projected to increase especially quickly in countries like Kenya and Saudi Arabia.

Conversely, having health insurance to defray medical costs can allow a family to preserve its economic contribution, which benefits both the family unit and the broader society. Moreover, by promoting access to preventive health services, screening and early detection, health insurers can reduce overall investment in treatment, shorten periods of disability among beneficiaries and potentially help to slow the trend towards worsening NCD impact.

Table 6 shows the principal insurer contributions to the HCHE and notes how those map with the behavioural precepts defined in the Using Behavioural Economics to Address NCDs section (page 10). The table also indicates the major connections that can occur between insurers and other ecosystem stakeholders.

Table 6: Insurers and the HCHE – actions, individual behaviour and stakeholder connections

Examples of insurer actions	Major behaviour precepts	Stakeholder connections
Health assistance		
Provide health-related coaching – in-person, online, via app, by phone	Choice architecture – Makes health advice easily accessible Framing – Improves access to data specific to personal condition	Care providers Technology
Provide fitness management advice and provide tracking devices	Framing – Emphasizes the ease of undertaking healthy behaviour (e.g., walking every day) Optimism – Takes advantage of belief that people will succeed in achieving goals	Care providers Technology
Provide access to medical advice, prescriptions by phone (telemedicine) and smartphone app	Choice architecture – Ensures easy access to medical assistance	Care providers Technology
Provide access to other professional health support (e.g., dietitians, nutritionists)	Choice architecture – Ensures easy access to broader health support	Care providers Technology
Provide access to second opinions	Loss aversion – Offers potential alternatives to costly/complex treatment paths Optimism – Capitalizes on people's belief they might have been misdiagnosed	Care providers
Funding		
Pay healthcare claims	Loss aversion – Decreases out-of-pocket costs	Care providers
Incentives		
Implement rewards to encourage smoking cessation, healthy eating and physical activity and reward specific accomplishments	Optimism – Takes advantage of people's confidence in their ability to succeed Loss aversion – Sets up rewards so that they are removed if people fall short of goals*	Care providers
Reimburse claims in full or at higher percentage for use of in-network medical facilities	Loss aversion – Capitalizes on desire to reduce personal cost	Care providers
Reduce premiums for specific behaviour and goals achieved (e.g., smoking cessation, weight loss)	Loss aversion – Capitalizes on desire to reduce personal cost	Care providers
Provide cash rewards for choosing treatments/facilities that lead to lower insurer costs	Loss aversion – Capitalizes on desire to reduce personal cost	Care providers
Information		
Conduct health-risk assessments and perform biometric screening at work or at a convenient location to provide information to individuals	Framing – Makes personal health risks clear and emphasizes need for action Choice architecture – Makes it easy to complete screening tests	Care providers
Provide online and in-person education about achieving and maintaining health	Choice architecture – Makes access to information as easy as possible	Care providers Technology
Make available links to additional information sources – e.g., federal health agencies, university health departments	Choice architecture – Ensures easy access to supporting information	Academia Government Technology
Deliver programme information to at-risk populations (e.g., high BMI)	Framing – Makes personal health risks clear and emphasizes need for action	Care providers
Collect and provide information from millions of individual cases on disease trends and care efficacy	Framing – Provides information that underscores health threats and suggests responses	Academia Care providers Community groups Government NGOs
Collect and provide information on drug-treatment efficacy	Framing – Provides information that emphasizes most effective actions in response to risk factors and NCDs	Academia Pharmaceuticals/ Devices Technology

*For example, instead of giving a reward (such as a cash payment for completing a health risk assessment or quitting smoking), set up an account the person can monitor (such as a gift card that isn't yet activated). Then take advantage of loss aversion by taking it away if the person fails to achieve or sustain the goal.

Case Study: Kaiser Permanente Thriving Schools aims to improve the health of students, staff and teachers

Kaiser Permanente, one of the largest non-profit healthcare organizations in the US, has long recognized the importance of schools as an epicentre of health impact and well-being in communities. In 2013, Kaiser Permanente began the Thriving Schools programme, a partnership with several other leading organizations working to support policy, systems and environmental changes in schools. The goal has been to shift the default behaviour of students, staff and teachers in support of healthy eating and physical activity. The programme has an added focus on the social and emotional wellness of non-faculty school employees, influential role models whose needs are often less addressed by school health programmes. Thriving Schools currently works with 115 districts across Kaiser Permanente service areas. Through its partnership with the Alliance for a Healthier Generation (AHG), the programme reaches 21 school districts, including 332 schools.

At Seaton Elementary School in Washington DC, where nearly all students come from low-income families and have limited safe areas for physical activity, Kaiser Permanente and AHG worked with school administration to implement a range of behaviour-change interventions. With grant support from Kaiser, Seaton hired a second physical education teacher and adjusted school schedules to ensure that all students receive 150 minutes of physical education every week. The school also restructured its meal programme to meet Department of Agriculture nutritional standards, supplementing meals with healthy-cooking classes and tastings to spark interest in more nutritious offerings.

Noncommunicable disease	Risk factors	Behavioural triggers
Cardiovascular disease	Unhealthy diet	Present bias
Mental illness	Physical inactivity	Framing
Diabetes/Metabolic syndrome		Availability/Narrative
		Social norms
		Choice architecture

As they interact directly and indirectly with individuals, insurers' roles touch mainly on choice architecture and framing behaviours, especially as they facilitate health maintenance and care and provide an information context for individual responses to health risks. A number of factors have motivated insurers to expand their ecosystem roles beyond providing a source of funding for healthcare. These include lowering healthcare costs, meeting individual and institutional demand for assistance in supporting individual wellness, potential competitive advantage gained by providing wellness services and the compatibility of wellness programmes with the larger mission of promoting health in their communities[31].

To the extent that an organization can help people remain well rather than merely fund disease care, individuals, populations and the organization all benefit.

Case study: Vitality's programme to increase physical activity and improve lifestyle behaviours

The Vitality programme, an insurance-based incentives approach originating in South Africa, breaks down long-term health improvement goals into achievable steps and provides rewards for small accomplishments with measurable health and lifestyle gains. In a three-and-a-half-year engagement study, the programme identified an increase in healthy food purchases among members, along with reduced hospitalization and length of hospital stays, and lower medical and prescription costs per participant.

These successes were attributed to high employee engagement within companies that:

- Promoted participation through a strong wellness communication strategy (capitalizing on information framing).
- Provided upfront incentives and a platform that promoted ongoing rewards for healthy behaviour (recognizing employees' bias for near-term rewards).
- Recruited an internal wellness champion who helped establish a social norm of good health.
- Offered services such as on-site health screening (making these an easy and convenient default choice for employees).

A five-year study of more than 100,000 Vitality members in the US found increases in the average number of weekly minutes of physical activity among participants. The greatest change occurred among the least active members, who experienced an increase of as much as 150% in their weekly minutes of activity. Furthermore, incremental physical activity was followed by improvements in other health-promoting behaviour and overall health status. The study also found that increased activity among members from the least-active group yielded the greatest improvement in their Vitality Age, a composite measure used to assess overall health status and risk of death.

NCDs	Risk factors	Behavioural triggers
Cardiovascular disease	Unhealthy diet	Framing
Chronic respiratory disease	Physical inactivity	Social norms
Diabetes/Metabolic syndrome		Optimism
Mental illness		Choice architecture/ Default
Cancer		

Retailers

Retailers act as a principal source of consumer products and therefore exercise particularly powerful influence over dietary quality. Financial motivation stimulates the desire to create a positive image within the community and thereby help to stimulate demand and build market share. Consequently, retailers are sensitive to market and governmental pressures that affect pricing, merchandizing, promotion and location decisions. Their visibility and their importance to daily life make retail organizations the economic focal point for many communities. This pivotal role gives the food retailing sector an extended range of potential influences over the landscape of health-risk factors and NCDs. Table 7 connects the main retail contributions to the HCHE with individual behaviour and interactions with other HCHE stakeholders.

Table 7: Retailers and the HCHE – actions, individual behaviour and stakeholder connections

Examples of retailer action	Major behaviour precepts	Stakeholder connections
Access		
Expand store availability and choices of healthy food, especially in current "food deserts"	Choice architecture – Makes purchasing healthy food easy	Government
Buy from local producers to support short food supply chains*, increase availability of culturally appealing foods	Framing – Supports local producers, seen as community contribution Social norms - increase prosperity of local community	Community groups Food Producers NGOs
Provide access to selected health services (e.g., vaccinations) on-site	Choice architecture - Makes possible one-stop healthcare	Care Providers
Information		
Display prominent, engaging, informative food labels (ingredients, calories, interpretive signals)	Framing – Emphasizes benefits of good nutrition	Government
Provide general information to customers on nutrition, food preparation, use of local products	Optimism – Brings together a group of actions to promote health; depicts good nutrition and tobacco avoidance as appealing and beneficial	Community groups Food producers NGOS Technology
Collect sales information to understand and respond to consumer purchase trends	Framing – Helps retailers and their supply chain develop context to refine product and information strategies	Food producers Technology
Marketing and merchandising		
Restrict advertising of unhealthy food to children	Depletion – Gives unhealthy food less prominence with consumers	Government
Promote healthy eating; promote tobacco avoidance	Present bias – Emphasizes near-term benefits of healthy behaviour rather than long-term harms or risks Availability – Narrative makes healthy choices appealing	Community groups NGOs
Dedicate more floor space to healthy food items	Choice architecture - Makes health purchase the low-effort option	
Prominently display healthy food items – eye-level, near check-out – and move unhealthy items to less visible and convenient locations	Choice architecture/default - Makes acquisition of healthy food easier Depletion – Requires more effort to acquire unhealthy food items	
Support local campaigns to urge healthy eating, increased exercise	Framing - Increases appeal of healthy activity Social norms - Makes pursuit of good health a community value	Community groups NGOs
Tell powerful stories of those who have benefited from healthier diets	Availability - Provides dramatic highlights that have more weight than statistics	Community groups NGOs
Pricing		
Work with policy-makers to develop pricing policies that encourage consumption of healthier food and beverage options	Default – Makes purchase of healthier foods easier Loss aversion – High price discourages purchase	Government
Increase prices of tobacco products	Loss aversion – High price discourages purchase	Government
Offer low-price drug options for tobacco-use cessation	Choice architecture – Makes access easy	Pharmaceuticals/ Devices
Product quality		
Increase inventory of healthy items	Choice architecture – Makes acquisition of unhealthy food more difficult	Food producers
Reduce inventory of tobacco products	Choice architecture – Makes acquisition of tobacco more difficult	
Advocate reformulation of food items to increase nutritional value; reduce sugar, salt and trans fats; shrink portion sizes and calories per portion	Choice architecture – Ensures healthy food becomes more prominent in stores and restaurants, easier to access	Food producers

*Short food supply chains (SFSCs) encompass a range of food product/distribution/consumption configurations intended to reduce the time and cost required to move food from production to consumption. They include farmers' markets, farm shops, collectives and community-supported agriculture.

Case study: Unilever's Lamplighter programme focuses on employee wellness

Unilever has implemented the Lamplighter programme, which uses health-risk assessments, alongside exercise, nutrition and mental resilience, to help employees improve their health and well-being. The programme currently operates in 46 countries, covering more than 35,000 Unilever employees. It includes global standards on medical and occupational health, non-smoking and mental well-being and can be tailored to each country's particular context and major causes of ill-health among employees. The adaptability of the programme is particularly important for an organization with employees around the world.

Using information from an employee health-risk assessment, participants work with the Lamplighter programme to develop a personal well-being plan that incorporates four components:

- Nutrition – Tailored nutritional advice to improve diet and reduce cholesterol and blood pressure
- Exercise – Personal exercise plan
- Mental resilience – Online tool that employees can use to monitor and improve stress and resilience
- Reassessment – Six-month follow-up with employee.

In the short term, the programme has reduced the overall health risk for Unilever employees and improved employee engagement, morale and productivity. In the longer term, the programme aims to lower healthcare costs.

NCDs	Risk factors	Behavioural triggers
Cardiovascular disease Chronic respiratory disease Diabetes/Metabolic syndrome Mental illness Cancer	Unhealthy diet Physical inactivity	Framing Social norms Choice architecture/ Default Optimism

We know that people profess an interest in improving their health but struggle with taking effective action: "How well individuals are able to translate food choices into future health outcomes is related to how much they know about diet, health, and nutrition… (But) the evidence is mixed on whether information and labels actually improve the healthfulness of food choices"[32]. In other words, information alone is not enough. Food choices must also be configured in a way that nudges people towards better decisions. This is where such factors as default options (e.g., making fruit salad easy to pick up and candy more difficult) and depletion (reducing the number of food options available and making nutritious food the dominant proportion) become important. Within schools, healthy meals can be pre-ordered for students; those who want less healthy food must make an effort to change their orders and pay the cost difference[33]. This kind of strategy calls into play a choice architecture trifecta of default, depletion and loss aversion, with special significance in the awareness and prevention portions of the care continuum.

Case study: Ahold uses behavioural triggers to reduce sale of unhealthy products

Ahold Delhaize, the giant retailer headquartered in the Netherlands with operations around the world, has taken creative steps to reduce the number of unhealthy food products marketed to children. As a result of ongoing dialogues with a range of stakeholders, including the Dutch Nutrition Society, the Dutch Heart Foundation and the Free University in Amsterdam, Ahold, through its Netherlands operating unit Albert Heijn, decided to tempt children and their parents with healthy choices instead of unhealthy ones.

To do this, it introduced the RockFrogs, a cartoon frog rock band that makes music and goes on adventures. The adventures are not explicitly about healthy eating but the characters always choose healthy food and drink along the way. The characters also appear in videos available online. The intention is to frame healthy messages suitable to Albert Heijn's young audience (three-eight years of age) and their parents.

The RockFrogs also appear on packaging to make them more appealing to this target audience. The characters are limited to products that meet the Dutch Green Tick health criteria, in categories with food items beneficial to health, such as fruit, vegetables and dairy. They cannot be used on products such as cookies or ice cream, or on those that do not meet strict limits for sugar, salt and saturated fat.

NCDs	Risk factors	Behavioural triggers
Heart disease Diabetes/Metabolic syndrome	Unhealthy diet	Availability/Narrative Choice architecture Depletion

Involving retailers in the promotion of health is not new. Supermarkets have long shared space with pharmacies and, more recently, with such other health providers as retail clinics and opticians. Many large retailers provide care (e.g., flu shots at the onset of the winter flu season). As frequently visited community sites, shops can act as information sources to individuals (about healthy eating), community groups and NGOs (about nutrition trends) and food producers (about shifts in consumer buying behaviour).

In the US, a major retailer's decision to go tobacco-free suggests that retail organizations may come to see participating in the HCHE as a source of public relations value that could translate into market share gains. In 2014, CVS Caremark, a large American pharmacy and consumer goods retailer, announced that it would stop selling cigarettes in its stores. Seeking to position itself as a healthcare company rather than merely a retailer, the organization has also changed its name from CVS Caremark to CVS Health.

A year later, the company announced two results. On the financial side, general merchandise sales fell nearly 8% during the quarter, on a same-store basis. CVS blamed the slump on the tobacco ban. Company executives said store sales would have been flat compared with the year before if they hadn't made the change[34]. At the same time, CVS published a study claiming the move reduced cigarette sales by 1% across 13 US states. The study compared total sales of tobacco products at all types of stores in the 13 states where CVS has more than 15% market share with sales in states that have no CVS stores. The study also showed a 4% increase in nicotine patch purchases in the 13 states in the period immediately after the end of tobacco sales. The company said this showed there also was "a positive effect on attempts to quit smoking"[35].

Case study: GlaxoSmithKline and care organization partner to help smokers quit

Only 3%–5% of people who try to quit smoking on their own actually succeed. Hoping to improve this percentage, GlaxoSmithKline (GSK) has collaborated with the not-for-profit National Jewish Health Quitline programme, QuitLogix, for more than 10 years. QuitLogix provides tobacco cessation support for Quitline programmes in US states. QuitLogix services are paid for by the state as part of anti-tobacco public health initiatives and offered at no cost to participants. The QuitLogix programme includes:

- Tobacco cessation coaches available 17 hours per day, seven days per week, year-round
- Up to five proactive coaching sessions with unlimited support calls
- Full pharmacotherapy programme, including nicotine replacement therapy (NRT) in various formulations, as well as coordination of pharmacy benefits and an eCoach (a web-based program offering information for participants, as well as text messaging, email and a mobile app available 24 hours a day).

Participants enrol in the programme online or by phone. A coach partners with the participant to develop a customized tobacco cessation plan that includes setting a quit date, identifying tobacco-use triggers, managing cravings and addressing relapses. National Jewish Health faculty provide oversight and training of coaches and staff.

From 2003 to 2016, 1.2 million participants enrolled in the QuitLogix programme. Among people who received pharmacotherapy, quit rates were 37%, compared with a little more than 20% for those who did not receive pharmacotherapy support. On screening, 80% received some form of NRT.

More than 400,000 participants have quit tobacco over the 13 years of the programme. Approximately 35% of those engaged in QuitLogix quit and remained tobacco-free six months later.

NCDs	Risk factors	Behavioural triggers
Heart disease Chronic respiratory disease Cancer Diabetes/Metabolic syndrome Mental health	Tobacco use	Framing Availability/Narrative Choice architecture Optimism

Technology

"Health technology" refers to the application of organized knowledge and skills in the form of devices, medicines, vaccines, procedures and systems developed to solve or prevent a health problem and improve the quality of lives[36]. Health-related technology also incorporates novel applications of existing devices, such as the use of ultrasound for diagnosis of breast cancer and the employment of mobile phones for gathering information from (and providing counsel to) people who do not have easy access to medical professionals.

Combating NCDs and contributing to the evolution of the HCHE offers a range of opportunities for the application of scientific knowledge to achieve practical ends – that is, the financial success and positive public image technology producers seek. Table 8 illustrates some of the ways technology use involves behavioural triggers and connects other stakeholders in the health ecosystem.

Table 8: Technology and the HCHE – actions, individual behaviour and stakeholder connections

Examples of technology actions	Major behavioural precepts	Stakeholder connections
Information collection and analysis		
Use wearable devices to provide consistent flow of personal activity and health information to both individuals and healthcare providers	Framing – Creates rich information context for health Choice architecture – Transfers data with no action required by the device user	Care providers
Enable NCD screening and diagnostics through use of cameras and biosensors integrated with mobile phones	Choice architecture - Makes disease diagnosis possible without extensive resources Depletion - Reduces effort required to provide and receive care	Care providers
Enable development of large databases permitting analysis of consumer behaviour trends, risk factors, disease and treatment patterns over extended populations and time periods	Framing - Provides context for improved diagnosis and treatment	Academia Care providers Insurers Pharmaceuticals/ Devices Retail
Use smartphones to record clinical data from patients for individual health records and for analysis of population disease patterns and treatment efficacy	Framing - Provides improved context for both individual care and population health analysis	Care providers
Contact and care		
Provide virtual synchronous or asynchronous contact between patient and physician (e.g., from patient to healthcare provider about health concerns; from provider to individual about medication, monitoring and appointment adherence)	Framing – Makes two-way conversations convenient and cost-effective Choice architecture - Makes contact with providers easier for patients	Care providers
Provide health education and information to individuals and groups through various media, including text messages	Framing – Reinforces key messages with consistent information flow	Care providers
Apply existing technologies for novel uses (e.g., ultrasound for breast cancer screening)	Choice architecture – Makes treatment more accessible	Care providers
Use point-of-care tests for cholesterol and diabetes screening (when access to laboratory services is a barrier to diagnosis)	Choice architecture - Makes disease diagnosis possible without extensive resources	Care providers
Use heat-stable insulin and glucose monitoring strips (where refrigeration is limited)	Choice architecture – Makes disease care accessible without extensive resources	Care providers Pharmaceuticals/ Devices
Use polypill (e.g., containing a fixed-dose of aspirin, a statin and one or two blood pressure-lowering drugs) to simplify medication use	Choice architecture – Makes it easy to stick with medical regimen Depletion - Reduces need for discipline in following provider instructions	Pharmaceuticals/ Devices Care providers
Provide healthcare workers with automated algorithms to assist in diagnosis and protocol adherence	Depletion - Reduces effort required to provide care	Care providers
Employ “automated hovering” to improve adherence to medical regimens	Framing - Provides constant information on need to adhere to care requirements	Care providers
Facilitate electronic transfer of payment among individuals, retailers, insurers and care providers	Choice architecture - Reduces need for formal infrastructure	Care providers Insurers Pharmaceuticals/ Devices Retail
Expedite individual transport to medical facilities through connection with transport providers	Choice architecture - Makes it easy to meet logistical requirements for care	Care providers Family and peers
Social connection		
Use social media to support formation of groups and exchange of information (e.g., on diet, activity and disease monitoring and care)	Social norms – Forges group connections through exchange of information and mutual support	Community groups Family and peers NGOs
Promote new health-oriented products and services through social media	Social norms – Makes information availability and sharing part of the social fabric	Community groups Family and peers NGOs

Technology can contribute at multiple points on the care continuum, with particular potential for increasing awareness and supporting medical treatment and disease management. Companies we usually associate with smartphones, search engines, home appliances and social media are investing to personalize disease prevention and stimulate healthy actions that tackle risks before they become disease. Common and relatively inexpensive technologies such as mobile phones can expedite the provision of information and medical services in low-income countries where health systems and physical infrastructure are lacking or under-resourced. For example, mobile phones are being used across the developing world for delivering health promotion messages and treatment reminders and connecting individuals with the information and resources they need to lead healthier lives. These applications make it easy for individuals to take action, in effect making good health choices the default decision. Sensors and diagnostic tools and techniques have been designed and developed over the past decades to detect markers of disease. In both HICs and LMICs, telehealth and mobile medicine have emerged as important tools for improving health access, affordability and outcomes. As technology contributes to the collection of health-related information, big health data will help scientists discern global and country-specific epidemiological patterns that can guide prevention and treatment initiatives. The information acquisition, storage, configuration and communication aspects of technology can help to frame health issues as important in individual's lives.

Technology can also play a role in directly influencing individual behaviour at the medical care point of the care continuum. Studies show, for example, that medication adherence in the year after a heart attack is poor, despite the obvious benefits of taking steps to avoid further sickness. The Center for Medicare and Medicaid Innovation in the US has funded a trial testing how technology and information framing can improve patient performance. Patients in the trial received a "smart" pill bottle that tracks and wirelessly transmits data about medication use. Patients who followed the daily medication regimen became eligible for a cash prize in a sweepstakes system. The next day, the patients received a message telling them whether they had won a prize – or letting them know whether they would have won if they had taken their medicine. These small but frequent and engaging rewards take advantage of the tendency to prefer immediate benefits (present bias) and play on the desire to avoid missing an opportunity (loss aversion). This kind of "automated hovering" is a cost-effective way to monitor patient behaviour and deliver direct feedback during people's daily lives[37].

Looking further down the path of technological development, health-related technology can be expected to contribute to what is referred to as the Fourth Industrial Revolution (that is, the fusion of technologies blurring the lines between the physical, digital and biological spheres). As we have seen, technologies such as smartphones and wearable fitness devices already collect highly detailed data about health and fitness. This information has the potential to transform individual care. An Economist Intelligence Unit study in 2015 found that 50% of doctors believe mobile technology will allow patients to participate more proactively in their own care in the next five years. The not-too-distant future may also bring such emerging innovations as pills that incorporate digital sensors to regulate drug release; robotic limbs that respond to a patient's thoughts; and virtual reality psychotherapists[38].

Case study: Ginger.io's technology as a cost-effective response for mental health

Ginger.io, a San Francisco-based digital mental health platform, uses a combination of smartphone technology, data science and clinical services to create personalized delivery of mental healthcare. Through a smartphone app, users can learn about coping strategies developed by medical experts, assess their own current state and obtain additional mental health support as needed. Individuals can also access a licensed therapist or board-certified psychiatrist, via video, who can refer to the patient's data to provide proactive and immediate care.

The Ginger.io platform also tracks statistics and general usage patterns of texts and phone calls and uses GPS to track movement. The combination of data (gathered passively, without conscious effort from the individual) makes it possible to map people's behaviour and produce insights into an individual's mood over time.

In employer settings, Ginger.io reports:

– Installation of the app for up to one quarter of the employee population

– Reduction of up to a third in the relative cost of care, per actual employee receiving care

– Among those receiving care, more than half showing at least a partial response (30% drop in symptom severity) over eight weeks.

Use of mobile applications to track behavioural health parameters and offer participants early access to services can prevent mental health deterioration, thereby improving lives and productivity.

NCDs	Risk factors	Behavioural triggers
Mental illness	Harmful use of alcohol	Present bias Loss aversion Choice architecture

The data on NCD prevalence and trends paints a picture that is both sobering and encouraging. On the one hand, as the trend lines show, the worldwide threat of NCDs is unlikely to abate soon. Especially in low-income countries such as Kenya, the projection out to 2025 is for a continued increase in DALYs associated with all five NCDs. On the other hand, many stakeholder sectors realize the scope of the challenge and are taking action to respond. Commenting on possible responses to the NCD crisis, researchers writing in *The Lancet* said: "There are many possible interventions for NCDs. However, the most robust available evidence for the effectiveness and effect of interventions is to lower the prevalence of the major risk factors through population-wide methods directed at everyone and to target treatment to people at high risk of NCDs"[39].

Case study: Technology from Philips encourages behaviour change

Studies suggest that obstructive sleep apnea (OSA) raises heart rate and increases blood pressure, placing stress on the heart and increasing the likelihood of hypertension, heart disease, stroke and diabetes. A positive airway pressure (PAP) device is often the preferred response to OSA. However, adherence to PAP therapy has proven to be poorer than adherence to HIV medications, suggesting it is among the most difficult treatments to tolerate.

DreamMapper, a mobile application and website from Philips Respironics, is designed to improve adherence to treatment by using psychological models of behaviour change. DreamMapper focuses specifically on creating a sense of urgency (loss aversion) and building confidence (optimism).

Adherence to therapy was measured using internal microprocessors housed within the therapy devices and modem and wireless technology. Data was communicated daily to a central server, to the healthcare providers and to the patients themselves. Measurements were reported at 90 days, as this is when many insurers determine whether they will pay for the medical devices, based on patient engagement and usage.

Data was analysed from more than 170,000 individuals, some of whom used DreamMapper and some of whom did not. Adherence at 90 days was significantly better in the technology group (78.5%) than in the non-technology group (62.6%). Adherence was even far superior among patients who were considered strugglers with the therapy in the first two weeks (46% for DreamMapper users, compared with 12% for non-DreamMapper patients).

Improving adherence has the potentially high impact of improving sleep broadly among patients, decreasing blood pressure and even assisting in the control of diabetes (also related to OSA). Recent studies have also demonstrated a link between OSA and cancer progression, making this another area of possible impact.

NCDs	Risk factors	Behavioural triggers
Cardiovascular disease	Tobacco use	Availability/Narrative
Diabetes/Metabolic syndrome	Unhealthy diet	Framing
	Physical inactivity	Loss aversion

Sharpening the focus on risk factors implies important roles for the stakeholders in the HCHE. The message from behavioural economics is clear, however: efforts to influence individual behaviour will fall short unless stakeholder initiatives take into account how people internalize information and make choices.

From information to action: The FIRE-C Model

As information proliferates and choices multiply, a critical challenge for HCHE stakeholders emerges: how to increase the likelihood that messages about individual health will inspire action rather than simply confuse, bore or frustrate people to the point of inertia. Here again, a consumer decision perspective proves useful. Producers and marketers of consumer-focused health technologies have found that people are more likely to act on what they learn when five conditions exist:

- **Frequency** – Brief messages and reminders come often, creating a frame that makes health-related information stand out. Example: you get multiple messages a day about things you can do to prevent diabetes.
- **Immediacy** – Messages fit the individual's daily routine and urge action at or near the present moment. Example: you get a phone message reminding you to get up and walk and you can do it right now, or very soon.
- **Relevance** – Content addresses a concern the individual knows he or she has, or perceives as a potential problem, and emphasizes that action is part of the solution. Example: reminders that walking will burn off some of those extra kilos, which will help prevent diabetes.
- **Ease** – Action requires minimal effort and cost for the individual, so that, reinforced by relevance, prudent action becomes a default. Example: you don't need to spend money or change your daily habits; just get up and start moving.
- **Community support** – Peers and local groups can become involved, making healthy choices the social norm. Example: take a friend when you walk to the market, or keep a commitment to get out every morning with your neighbourhood walking group.

Individual behaviour is complex and idiosyncratic; no single communication approach will work for everyone, everywhere, across the world. Nevertheless, the decision to act – to change one's diet, stop smoking, become more active, avoid harmful use of alcohol, acquire a less-polluting cookstove – often begins with information flow between the stakeholder and the individual. When other behavioural triggers are in place, receiving and understanding information can be followed by a decision to do something about the new insight. The five FIRE-C elements provide a framework to help stakeholder understand and undertake this process.

Conclusion and Call to Action

NCDs are the largest cause of mortality and DALYs globally. NCD mortality exceeds that of communicable disease and maternal, perinatal and nutritional conditions combined[40]. Underlying risk factors such as unhealthy diet and lack of physical activity remain problematic, meaning the threat of diabetes, cardiovascular disease and other NCDs continues to rise.

Many governments, academic institutions, civil organizations and other stakeholders realize the scope of the challenge and are taking action to respond. For that response to have its greatest effect, the classic healthcare model centred on care providers and disease states must evolve. That outdated model, with its focus on treatment, requires societies to deal with the complex, chronic needs of millions of NCD patients. This challenge is economically daunting, even for high-income countries, and lies beyond the capacity of health systems in many developing countries. A better solution is to redefine what we mean by "health system" – not a set of independently functioning providers and funders focused mainly on disease treatment but rather a system of stakeholders whose combined actions make personal, prevention-oriented action possible. A more human-centric system moves the responsibility and the capacity for initiative towards individuals and away from institutions, and presents individuals with choices that encourage healthy behaviour. It shifts emphasis towards the early part of the care continuum (awareness and prevention) and away from efforts that chiefly emphasize treatment of preventable disease.

The human-centric health ecosystem produces optimal health results only when stakeholders cooperate to reduce the inherent friction that arises in any complex system requiring coordinated effort. Cooperation within the HCHE works best when three conditions exist:

- Stakeholder motivations are sufficiently strong to overcome the inevitable barriers that threaten to impede smooth system functioning.
- Pursuing their own motivations brings stakeholders into alignment with each other, rather than into conflict.
- Stakeholder actions inform, empower and stimulate individual initiative to act on risk factors and prevent and mitigate NCDs.

We think these conditions are most likely to emerge when individuals act as informed consumers. To play their central HCHE role effectively, people need information about the health-risk factors they face and the NCD threats those risk factors pose. They also need to experience behavioural conditions that make healthy choices easy to act upon.

Call to Action

Creating an efficient, effective and impactful HCHE requires collaborative action between the private and public sectors, with a firm focus on influencing individual behaviour. The combination of both new and traditional players, in some cases with redefined and evolving roles, is critical to delivering the many benefits the HCHE offers. However, achieving this combination requires deliberate action from stakeholders and individuals alike.

For stakeholders

1. Understand the critical individual behaviours that need to occur and the unique role each stakeholder plays in enabling such behaviours.
2. Strive to align interests with other stakeholders and reduce the barriers to cooperative action. In multistakeholder ecosystems, frictions inevitably arise among organizations pursuing different motives to achieve different goals. Not only is it possible to reduce those friction points but also to turn them into enablers of greater cooperation.
3. Make population health – not healthcare – the target of the business strategy.
4. Take the long view. Helping individuals achieve sustainable good health represents a market opportunity as well as a social boon, but one that may require a vision extending beyond current market pressures. Put simply, keeping customers alive and healthy ensures an ongoing product and service market and is, therefore, worthy of investments that pay off down the road.
5. Embrace technology. Technology is increasingly an accelerant for sharing information, connecting stakeholders and (re)shaping behaviour and can help address many of the traditional impediments to an effective HCHE.

For the individual

1. Understand the opportunity to reduce the risk of NCDs through health-promoting behaviour.
2. Challenge old perspectives and reflexive habits. Be aware of behavioural tendencies and react to NCD risks as rationally and logically as possible.
3. Become informed about the capabilities of various stakeholders and how best to engage with them to realize the desired outcomes.
4. Build social connections that help improve and sustain well-being. Social networks add energy and focus to individual efforts, increasing the likelihood that people can play effectively the critical role we have identified, at the centre of the HCHE.

Case Studies

In addition to the summary case studies included in this report, detailed case study material and additional examples, as listed below, are featured in the Human-Centric Health: Case Study publication by the World Economic Forum.

Organization	Case study topic
Ahold Delhaize	Ahold Delhaize uses behavioural triggers to reduce sale of unhealthy products
ASANTE/Power to Prevent Program (South Africa)	Mobile-phone technology improves diabetes care in sub-Saharan Africa – two examples
Cambridge Holdings	Cambridge Holdings – Health and the built environment
Centro de Recuperação e Educação Nutricional (CREN Brazil)	Using education to treat malnourished children through daily routine
CORE Foods	CORE Foods makes health the bottom line
Diabetes Prevention Program	Diabetes Prevention Program (DPP) connects government, non-profit and companies
Ensemble Prévenons l'Obésité Des Enfants (EPODE France)	Preventing childhood obesity through cross-sector partnerships
Ginger.io	Ginger.io's technology as a cost-effective response for mental health
GlaxoSmithKline	GlaxoSmithKline and care organization partner to help smokers quit
Global Alliance for Clean Cookstoves/Envirofit International	Clean cookstoves prevent NCDs in low-resource settings
Healthy Retail SF	Healthy Retail SF supports small food stores
Kaiser Permanente	Kaiser Permanente Thriving Schools aims to improve the health of students, staff and teachers
Let's Move!	Solving the challenge of childhood obesity within a generation
Multi-university research	Ciclovías promote physical activity yield benefits at low cost
Novo Nordisk and Copenhagen, Denmark	Cities changing diabetes
Pan American Health Organization (PAHO)	Turning internet use into an ally in the fight against NCDs
Perinatal Mental Health Project	Integrating maternal health and mental care in South Africa
Philips Respironics	Technology from Philips encourages behaviour change
Syngenta	Secure storage of pesticides in India to prevent suicide
Unilever	Unilever's Lamplighter programme focuses on employee wellness
United Healthcare	Health Life Clubs in Brazil
University of California, San Francisco	Food banks contribute to diabetes care
University research	Good oral health can reduce risk of NCDs
Vitality	Vitality's programme to increase physical activity and improve lifestyle behaviour
Zoojoo.be	Use of technology and socialization to accelerate individual engagement in health

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